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PRE-APPEAL BRIEF REQUEST FOR REVIEW

Docket Number (Optional)
024.0016 (02-1318)

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In re Application of **Robert R. Rice, et al.**

Application Number	Filed
10/668,818	September 22, 2003

For: **HIGH SPEED LARGE CORE MULTIMODE FIBER OPTIC TRANSMISSION SYSTEM AND METHOD THEREFORE**

Group Art Unit	Examiner
2613	**Bello, Agustin**

Applicant requests review of the final rejection in the above-identified application. No amendments are being filed with this request.

This request is being filed with a notice of appeal.

The review is requested for the reason(s) stated on the attached sheet(s).

Note: No more than five (5) pages may be provided.

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96)

☒ attorney or agent of record. Registration number **46,893**

☐ attorney or agent acting under 37 CFR 1.34(a). Registration number if acting under 37 CFR 1.34(a). _____.

/ERIN P. MADILL, REG. NO. 46,893/
Signature

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January 16, 2008
Date

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

☐ *Total of _____ forms are submitted.

UTILITY PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.:	10/668,818	Confirm. No.:	1950
Applicant:	Robert R. Rice et al.	Art Unit:	2613
Filed:	September 22, 2003	Examiner:	BELLO, AGUSTIN.
Docket No.:	024.0016	Customer No.:	55,397

Title: HIGH SPEED LARGE CORE MULTIMODE FIBER OPTIC TRANSMISSION SYSTEM AND METHOD THEREFORE

ARGUMENTS ACCOMPANYING PRE-APPEAL BRIEF REQUEST FOR REVIEW

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Final Office Action of November 14, 2007, Applicants request review of the final rejection in the above-identified patent application.

Applicants respectfully submit the following remarks which point out clear errors in the current rejections for at least the following reasons.

Patentability of Claims 26-30 Over The Cited References

1. Applicants submit that claim 26 is patentable since the cited references fail to teach or suggest every limitation of claim 26.

The Examiner concedes that Numata does not teach or suggest the claimed doped cladding layer. That is, the Numata fails to teach or suggest, for example, a selected LCMFOC which comprises a doped cladding layer that "attenuates higher order fiber modes as said focused short light pulses propagate down the selected LCMFOC so that said focused short

light pulses propagate through the selected LCMFOC with reduced short pulse spreading effects that limit the length/data rate product of said selected LCMFOC," as recited in claim 26. Applicants submit that the other cited references, including Seigman, fail to cure the deficiencies of Numata.

Notably, although Seigman hints that a portion of cladding 14 can be doped, Seigman in no way teaches or suggest that the cladding 14 would "absorptively attenuate," as required by claim 26. **Siegman does not teach or even remotely suggest that the cladding is doped to absorb unwanted modes in the cladding**. In fact, Seigman teaches the complete **opposite**. Because the cladding 14 of Seigman is implemented as part of a fiber laser, Seigman pumps the optical fiber through the cladding to activate the dopants in the cladding 14 to emit radiation to establish gain in the core of the fiber laser. Thus, the cladding 14 in Seigman acts as a radiator which is intended to produce gain – the exact opposite principle as absorption.

Accordingly, the cladding 14 in Seigman does not attenuate or absorb higher order modes. Therefore, for at least these reasons, the cladding 14 of Seigman is not "selected to … to absorptively attenuate higher order fiber modes generated in said LCMFOC," as required by claim 26.

2. Applicants submit that claim 26 is patentable since there is no reasonable expectation of success.

Numata relates to an optical transmission system S_a for data transmission which employs optical communication fibers without gain. By contrast, Seigman relates to the technical field of fiber lasers which operate by pumping light into the cladding so that the light is refracted/injected into the core of the fiber to thereby activate a dopant in the core of the fiber and create a gain. Applicants submit that one of ordinary skill in the art would not reasonably expect that incorporating a fiber laser as taught by Seigman into the optical transmission system S_a of Numata would work.

To the contrary, one skilled in the art would understand that attempting to incorporate a fiber laser into the optical transmission system S_a of Numata would destroy the intended operation of the optical transmission system S_a of Numata. To explain further, in the fiber laser taught by Seigman, the fiber core must have a dopant that can provide optical gain (not attenuation) at the desired wavelength. In addition, pump light must be injected into the cladding of the fiber so it can be refracted into the core to excite the dopant and generate

coherent light in the core. The coherent light generated inside the core is then trapped by the step in the index of refraction between core and cladding, and is guided down the core. Thus, because Seigman relates to a fiber laser, Seigman requires that "pump" light is injected into cladding 14. If the cladding 14 in Seigman's fiber was absorbing (as required by claim 26), pump light would be attenuated, and therefore would not pump the dopant in the core to create the gain, which is a fundamental goal of the fiber laser taught by Seigman. When dopants are not activated by optical pumping, such dopants will not produce a gain, and absorption in the core will prevent ability to propagate the optical signal. As such, the **intended operation of Seigman's fiber laser would be destroyed**.

On the other hand, if one skilled in the art attempted to use the fiber laser of Seigman in conjunction with a high speed optical communications system (such as those taught by Numata), optically pumping the cladding would be counter productive because it would cause gain rather than absorption in the cladding, thus amplifying rather than attenuating the unwanted higher order modes. The gain media would only be able to react to optical pulses sent down the fiber if those optical pulses were transmitted at a limited bandwidth or rate. That is, active dopant materials (such as those in Seigman) are typically limited to pulse rates in the range of 1-2 gigabits. For at least this reason, significant pulse length dispersion would occur if one attempted to use Seigman's fiber laser in the context of Numata's a high data rate communication system, and therefore the **intended operation of Numata's system would be destroyed**.

3. Applicants submit that claim 26 is patentable since the combination of the Numata and Seigman references that is proposed by the Examiner would not work as recited in claim 26.

Applicants submit that the combination of the Numata and Seigman references proposed by the Examiner would not work in the manner that is recited in claim 26. As noted above, the claimed embodiments relate to the field of communication fibers in which a passive dopant is placed in the cladding to absorb light and thereby attenuate the unwanted higher order modes which are excited in the core of the fiber. In embodiments of the present invention, power input to the core of the fiber is either propagated down the core of the fiber, or refracted out of the core of the fiber and into the cladding, which is appropriately doped for absorption. As such, power refracted into the core is absorbed. The high order modes, because of their mode

transverse phase profiles, have a naturally greater beam spread and are therefore more readily refracted out of the core of the fiber and then absorbed in the cladding.

In stark contrast, Siegman does not teach or even remotely suggest the concept of absorbing unwanted modes in the cladding. Instead, Seigman relates to an active fiber laser in which a dopant is placed in the central core of a fiber, and is then optically pumped and excited, which causes the dopant to have optical gain and act as a laser which emits light at wavelengths set by the particular dopant. Siegman establishes a transverse gain profile in the core of the fiber with appropriate doping to match the low order mode profile. This technique provides "gain guiding" of low order modes in the core of the fiber as **laser active modes (i.e., gain provides laser power growth)** in the core of the fiber. Siegman also provides a refractive index profile in the core of the fiber (through a secondary doping) to refract higher order modes outward into the cladding. As such, the higher order modes can either propagate along the fiber in the cladding, or are lost out of the cladding and the fiber.

Significantly, embodiments of the present invention do not utilize the fiber as a laser--there is no gain in the core of the fiber, which has a very simple and classical step refractive index profile, and the passive dopant is not optically pumped and has no gain. Embodiments of the present invention, employ a simple fiber as a wave guide without gain or gain guiding, and use the natural refraction due to phase profiles of higher order modes to refract the higher order modes into the cladding for absorption (i.e., the cladding has a simple uniform doping profile that absorbs the modes that are refracted into it). In fact, if core of the fiber in the disclosed embodiments of the present invention had gain and thus provided gain guiding, then the disclosed embodiments **would not work** since all modes within the core would be gain guided and therefore would not escape into the cladding.

As such, nothing about Seigman would suggest the desirability of modifying the system described in the Numata to arrive at the combination of selecting a particular LCMFOC having a doped cladding layer "that is selected to excite low order fiber modes of the selected LCMFOC and to absorptively attenuate higher order fiber modes of the selected LCMFOC which contribute to pulse spreading to increase a transmission distance through the selected LCMFOC," as recited in claim 26. Simply put, a reduction of higher order modes would not result from the combination of these references so that the signal output from the MMF 12 of Numata et al would include "substantially only lower order modes."

Therefore, Applicants submit that claim 26 is patentable since the cited references: (1) fail to teach or suggest all recitations of claim 26, (2) fail to provide any reasonable expectation of success, and (3) would not work if combined in the manner proposed by the Examiner.

Claims 21-25, 31 and 32, 33, 34, 35-37

For reasons similar to those discussed above with respect to claim 26, Applicants submit that these claims are also patentable over the cited references.

Applicants respectfully submit that the application is now in condition for allowance, and such allowance is therefore earnestly requested. The Office Action Made Final was mailed November 28, 2007 and set a shortened statutory period of three (3) months for response. This Pre-Appeal Brief Request for Review and the accompanying Notice of Appeal pursuant to 37 C.F.R. §41.31(a) are submitted on December 19, 2007 (i.e., within the third month). If for some reason Applicants have not requested a sufficient extension and/or have not paid a sufficient fee for this response and/or for the extension necessary to prevent abandonment on this application, please consider this as a request for an extension for the required time period and/or authorization to charge Deposit Account No. 50-2091 for any additional fee which may be due.

Respectfully submitted,

INGRASSIA FISHER & LORENZ, P.C.

Dated: January 16, 2008

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